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Letter to the Editor

Type of Chemotherapy-Induced Peripheral Neuropathy, Influencing Factors, and Functional Status

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Dear Editor-in-Chief

Colon cancer commonly has distant metastasis to the liver, lung, lymph node, and bone; most patients receive chemotherapy to block micrometastasis after surgery (1). As chemotherapy to treat colon cancer, the FOLFOX regimen, which combines folinic acid, fluorouracil, and oxaliplatin, is often used. Oxaliplatin, a platinum-based chemotherapy drug, has been demonstrated to play an important role in increasing the survival of colon cancer patients and reducing the recurrence rate; however, as a chemotherapy drug that causes damage to the dorsal root ganglia, oxaliplatin is known to cause peripheral neuropathy in colon cancer patients (2).

Chemotherapy-induced peripheral neuropathy is highly relevant to the safety of patients, such as with regard to fender-bender accidents, falls, and external wounds, and it generally lowers the ability to sustain ordinary life functions (3, 4). Most previous studies focused on the occurrence of symptoms, rather than a multi-dimensional and multifactorial approach to the symptoms, so it is insufficient for medical staff to understand merely the symptoms. Thus, this study sought to provide basic data for interventions according to the type of peripheral neuropathy for medical staff practitioners by understanding the symptoms of peripheral neuropathy, based on the theory of unpleasant symptoms, and understanding the influencing factors and functional status according to symptom type.

This was a cross-sectional and descriptive research study. The subjects included 250 patients with colorectal cancer who were admitted to Kyung Hee University Hospital between June, 13, 2012 and May, 30, 2013, and underwent chemotherapy. This study was conducted to distinguish the clusters centered on the peripheral neuropathy symptoms of the subjects, and the appropriate number of clusters was calculated. The final number of clusters was three. The differences among the three clusters are shown in Table 1.

Each cluster was a heterogeneous cluster distributed independently ($F = 28.70$-502.20, $P < 0.001$). Age, time elapsed after surgery, chemotherapy cycle, cumulated dose of oxaliplatin, nutritional risk status, number of peripheral neuropathy symptoms, fatigue, anxiety, and depression were found to differed among the three groups. For the motor symptom group, eight factors, with the exception of anxiety ($P = 0.149$) were confirmed to be influencing factors. In the sensory symptom group, eight factors, with the exception of depression ($P = 0.141$) were confirmed to be influencing factors (Table 2). Upon analysis of functional status according to symptom type, there were significant differences in all symptom types for physical function ($F = 36.84$, $P < 0.001$), social function ($F = 18.97$, $P < 0.001$), emotional function ($F = 8.30$, $P < 0.001$), cognitive function ($F = 14.64$, $P < 0.001$), and role function.

Table 1: Symptom types of chemotherapy-induced peripheral neuropathy (n=250)

Category	Symptom type 1 n=54	Symptom type 2 n=73	Symptom type 3 n=123	F
	M(SD)	M(SD)	M(SD)	
Cold sensitivity	-0.91(0.01)	1.21(0.77)	-0.35(0.64)	189.61*
Hand numbness	-0.79(0.01)	1.39(0.57)	-0.45(0.55)	357.64*
Foot numbness	-0.76(0.01)	1.42(0.57)	-0.47(0.50)	422.71*
Hand tingling	-0.46(0.68)	1.30(0.85)	-0.48(0.45)	220.31*
Foot tingling	-0.62(0.01)	1.26(0.94)	-0.43(0.43)	200.10*
Nerve pain	-0.43(0.01)	0.68(0.57)	-0.21(0.51)	28.70*
Joint pain	2.26(0.58)	-0.41(0.41)	-0.32(0.44)	502.20*
Muscle weakness	2.15(0.57)	-0.45(0.53)	-0.27(0.51)	348.08*
Loss of balance	2.23(0.58)	-0.47(0.29)	-0.28(0.52)	444.14*

* P <0.001; M, mean; SD, standard deviation

Table 2: Influencing factors of peripheral neuropathy symptoms

Type	Variables	B	SE	Wald	*P*	OR	95% CI lower	95% CI upper
Motor	Constant	-5.90						
	Age (yr)	0.05	0.01	1.87	0.005	1.05	1.01	1.08
	Period post-operation	0.31	0.06	12.86	0.030	2.18	1.22	3.40
	Chemotherapy cycle	0.68	0.21	35.55	<0.001	3.01	2.51	3.61
	Cumulative of oxaliplatin	0.60	0.28	30.56	0.039	2.82	2.17	3.39
	Nutritional risk status	0.58	0.20	25.30	0.040	2.78	2.06	3.99
	Number of perceived symptoms	0.67	0.18	32.17	<0.001	2.96	2.55	3.47
	Anxiety	0.07	0.04	2.08	0.149	1.07	.97	1.18
	Depression	0.28	0.05	12.65	<0.001	1.20	1.08	1.32
Sensory	Constant	-4.13						
	Age	0.04	0.01	1.19	0.013	1.03	1.01	1.05
	Period post-operation	0.10	0.04	4.62	0.032	1.11	1.01	1.21
	Chemotherapy cycle	0.37	0.08	11.67	<0.001	1.54	1.43	1.60
	Cumulative of oxaliplatin	0.41	0.13	14.93	0.043	1.70	1.48	1.98
	Nutritional risk status	0.56	0.16	24.32	0.038	2.65	1.73	2.67
	Number of perceived symptoms	0.71	0.21	36.66	<0.001	3.08	2.61	3.56
	Anxiety	0.14	0.05	8.55	0.003	1.16	1.05	1.28
	Depression	0.24	0.06	11.37	0.141	1.44	.43	2.29

*Reference group, minimal type; SE, standard error, OR, odds ratio; CI, confidence interval/Model fit: -2 Log Likelihood=368.27, χ^2=177.70, df=8, P<0.001/Cox and Snell R^2 =0.48, Nagelkerke R^2 =0.55, McFadden R^2 =0.32

Upon analysis of functional status according to symptom type, there were significant differences in all symptom types for physical function (F = 36.84, P < 0.001), social function (F = 18.97, P < 0.001), emotional function (F = 8.30, P < 0.001), cognitive function (F = 14.64, P < 0.001), and role function.

This research has scholarly significance in that we categorized the symptoms of peripheral neuropathy in colon cancer patients who were undergoing chemotherapy using the data-mining method and confirmed the related factors per symptom type. It also has clinical significance in that it provides basic data for medical staff who encounter colon cancer patients undergoing chemotherapy. These

data will facilitate establishment of a care plan to alleviate peripheral neuropathy symptoms. However, because chemotherapy-induced peripheral neuropathy is related to multiple risk factors, investigation of additional related factors in addition to those suggested herein, and confirmation of changes in the symptoms according to temporal flow, is necessary.

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